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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/661,379	09/12/2003	Zhiping Yin	303.864US1	6694

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EXAMINER

ROSASCO, STEPHEN D

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 05/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/661,379

Applicant(s)

YIN ET AL.

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 March 2005.
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-20 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2-28-05

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____

Detailed Action

Applicant's election without traverse of Group I (claims 1-20) in the reply filed on 3/07/05 is acknowledged.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3, 13, 15 and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Babich et al. (5,830,332).

Babich et al. teach a method of reactive sputtering for depositing an amorphous hydrogenated carbon film (a-C:H). Such films are optically transparent in the visible range and partially absorbing at ultraviolet (UV) and deep UV (DUV) wavelengths; in particular, 365, and 248, 193 nm. Moreover, the films produced by this method are amorphous, hard, scratch resistant, and etchable by excimer laser ablation or by oxygen reactive ion etch process. Because of these unique properties, these films can be used to form a patterned absorber for UV and DUV single layer attenuated phase shift masks. Film absorption can also be increased such that these films can be used to fabricate conventional photolithographic shadow masks.

And wherein said work piece is a phase shift mask used to form a pattern in a photoresist by exposing said photoresist to said first wavelength through said phase shift mask.

Babich et al. also teach exposing said work piece to light at a first wavelength selected from the group consisting of 365 nm, 248 nm and 192 nm;

and inspecting said work piece using light having second wavelength of 488 nm.

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The exposure at 488nm for inspection is in the visible range of 40-700nm that is claimed by applicant for viewing through the amorphous carbon layer.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Babich et al. (5,830,332) in view of Veerasamy et al. (6,447,891) and You et al. (6,864,556).

The claimed invention is directed to a device in a process, the device comprising: a substrate; a device structure formed over the substrate;

and a masking structure formed over the device structure, the masking structure including an amorphous carbon layer, wherein the amorphous carbon layer is transparent in visible light range (400-700 nm).

And wherein the amorphous carbon layer has an absorption coefficient between about 0.15 and about 0.001 at wavelength of 633 nanometers.

And wherein the amorphous carbon layer has a thickness greater than 4000 Angstroms.

And wherein the masking structure further includes a silicon oxynitride layer formed over the amorphous carbon layer.

The applicant states that some conventional masks are made of amorphous carbon. However, an amorphous carbon mask at some thickness may have a high absorption of optical light, causing the amorphous carbon mask inapplicable for some processes.

And further the applicant states that since the amorphous carbon layer 430 is transparent in the visible light range, the thickness of amorphous carbon layer 430 may not be

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limited. Thus, amorphous carbon layer 430 may be formed with a thickness to properly etch device structure 320 while allowing an accurate reading of the alignment marks such as alignment marks 214.

Thus the amorphous carbon layer is protective of the surface during etching and the reason for having it transparent to optical light is so that alignment can be performed by viewing through the layer.

Babich et al. teach a method of reactive sputtering for depositing an amorphous hydrogenated carbon film (a-C:H). Such films are optically transparent in the visible range and partially absorbing at ultraviolet (UV) and deep UV (DUV) wavelengths, in particular, 365, and 248, 193 nm. Moreover, the films produced by this method are amorphous, hard, scratch resistant, and etchable by excimer laser ablation or by oxygen reactive ion etch process. Because of these unique properties, these films can be used to form a patterned absorber for UV and DUV single layer attenuated phase shift masks. Film absorption can also be increased such that these films can be used to fabricate conventional photolithographic shadow masks.

And wherein said work piece is a phase shift mask used to form a pattern in a photoresist by exposing said photoresist to said first wavelength through said phase shift mask.

Babich et al. also teach exposing said work piece to light at a first wavelength selected from the group consisting of 365 nm, 248 nm and 192 nm;

and inspecting said work piece using light having second wavelength of 488 nm.

The exposure at 488nm for inspection is in the visible range of 40-700nm that is claimed by applicant for viewing through the amorphous carbon layer.

The teachings of Babich et al. differ from those of the applicant in that the applicant teaches the use of some additional film thicknesses for the amorphous carbon layer and the use of a silicon oxynitride capping layer.

Veerasamy et al. teach a coated article comprising: a substrate; a low-E coating system provided on said substrate; said low-E coating system including at least one infrared (IR) reflecting layer and a protective substantially non-crystalline diamond-like carbon (DLC) inclusive layer provided in a position such that said IR reflecting layer is located between said substrate and said protective DLC inclusive layer; and wherein said DLC inclusive layer has an average density of at least about 2.4 gm/cm^3 , wherein at least about 40% of carbon-carbon (C-C) bonds in said DLC inclusive layer are sp^3 carbon-carbon bonds, and wherein said DLC inclusive layer is from about 10-250 Å thick.

And wherein said DLC inclusive layer includes highly tetrahedral amorphous carbon.

And wherein the coated article has a visible transmittance of at least about 75%.

You et al. teach a structure formed during manufacture of a semiconductor device, the structure comprising: a patternable layer formed above a substrate; an antireflective coating comprising an organic polymer layer of poly-p-xylylene formed over the patternable layer, and a silicon oxynitride layer formed over the organic polymer layer, and a photoresist pattern formed over the silicon oxynitride layer.

It would have been obvious to one having ordinary skill in the art to take the teachings of Babich and combine them with the teachings of Veerasamy et al. and You et al. in order to make the claimed invention because the thickness of the coating is a function of the processing parameters, e.g., etching, and the use of silicon oxynitride as a capping layer for a organic layer is taught and the applicant is using known structures for their known benefits.

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Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'S. Rosasco', with a stylized, elongated flourish extending to the right.

S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
04/12/05